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March 21, 2019

Board of Supervisors
County of Napa
1195 Third Street, Suite 210
Napa, CA 94559

Re: Draft Watershed and Tree Protection Ordinance

Dear Board of Supervisors,

I have been following the development of the Draft Watershed and Tree Protection Ordinance ("Draft Ordinance") carefully, in particular the calls from all sides for more science. I agree completely that more science is needed to ensure that the policies you are considering today have the desired effects now and in the future. To that end, I respectfully submit this letter that outlines considerable research I have done regarding two prominent portions of the conversation where science has been lacking: climate change and watershed health.

**SECTION 1: A QUICK SCIENCE REFRESHER**

Understanding the natural world is indescribably complex, and our minds alone are not equipped to understand it. Common sense fails us, almost without exception, when we try to apply it to nature. Imagine if we only ever relied on common sense to judge if the earth was flat. Imagine, if we used common sense to judge if we humans can alter the climate of our giant planet. If we relied on our common sense to move progress forward in our understanding of the world, we would be stuck in the dark ages at best, and extinct at worst.

Our best chance, as a species, of getting a grasp on the complex world we live in is the use of science. Science, itself, is a very difficult task. The number of junctions where it can mislead are numerous. One must look out for biases, bad data, extrapolations of data, and countless more things that can lead to "bad science". In terms of this letter I will deem 'bad science" as well-intentioned studies done incorrectly, studies that are intentionally misleading, the misrepresentation of good science for political reasons, the deliberate use of bad science, or the use of verbiage that sounds scientific but is not based in science. The last two of that group are particularly important both on a national level, and the subject at hand here today. In general, most people want to have the scientific community behind them on a given issue, as it lends credibility. This could be a good thing, as it could be that we are a fact/data driven society that makes decisions on the best evidence available, but a side effect of this desire is that people distort or lie about science when they want it to fit their world view. This is bad science. This can be seen in climate change debates on the national level, where if someone picks temperate data on a specific year, they can make it appear the earth is cooling. Another way people distort science is the common "correlation equals causation" fallacy. This is immoral if done intentionally and bad leadership if done by accident.

I am an avid environmentalist, so much so I decided to make it my life's work. I graduated with a Bachelor of Science in Environmental Science and Management from UC Davis with a focus on Watershed Science. I did this because I loved the topic, I got to read and study good and bad environmental policy from all around the world. It became apparent to me that careful scientific study needed to be a foundation for any environmental policy. When government and citizens would "guess" on the right answer they almost always ended up wrong.

So how do we move from bad science to good science to inform the wisest policy? The simple answer is the scientific method. A quick reminder on the steps of the scientific method ("The Scientific Method"):

1. Make an observation
2. Ask a question
3. Propose a hypothesis
4. Make predictions
5. Test predictions
6. Iterate

This leads us to the policy proposal at hand, the Draft Watershed and Tree Protection Ordinance. The scientific process, unfortunately, has been held in utter disregard during this process. I have seen claim after anti-scientific/alarmist claim being perpetrated in meetings, in the newspaper, from members of the government, to members of the public. What's worse, these baseless claims are the definition of bad science, where people are distorting good science, or lying about science all together. The few people who request proof of concept in this proposal, or call for more information/data are painted as anti-environmental. This is a perversion of reality. Nothing gets under my skin more than seeing my two passions, science and the environment, being distorted. I do believe that most people supporting this ordinance are doing so because they genuinely believe that it is the right thing for climate as well as other environmental reasons, and it is those people who I am reaching out to. See, I was so bothered by this ordinance's complete lack of science that I decided to do something about it, and I got the data myself. If you want the science on this issue, please keep reading, and for those of you who just arbitrarily want 90% tree cover because it merely sounds nice with no evidence to back up this number, this letter is not for you. All references and citations are provided at the end of this document.

## SECTION 2: CLIMATE CHANGE

### Section 2.1: Deforestation and Climate Change

Climate change is real, human caused, and a threat. One could use numerous sources here as evidence, though for simplicity's sake we will use NASA as our foundation (Earth Science Communications Team, 2019). With this in mind, it is fair to argue that each person and their respective governments should make good faith efforts to do their part in combating this threat. This is seemingly one of the main motivations behind this ordinance. However, let's take a large step back to see why people think this Draft Ordinance is rooted in science, when in fact it is not.

#### Question 1: Why do we think that preserving trees will have an effect on climate change?

The first reason may be because of the common knowledge, especially among environmentalists, that trees and other plants contain stored carbon (sequestered carbon) that was pulled out of the atmosphere. It is also widely known that the carbon dioxide ($CO_2$) that trees pull from the air is a greenhouse gas that

exacerbates climate change (Earth Science Communications Team, 2019). Therefore, if $CO_2$ is bad and trees store $CO_2$, then one might assume we should have more trees to help the problem.

Another reason why we may think more trees are better is due to alarming headlines such as, "Global climate targets will be missed as deforestation rises, study says" by CNN (Picheta, 2019), or "Deforestation and Its Extreme Effect on Global Warming" by Scientific American (Scheer and Moss, 2012). To avoid the trap of bad science we must look past the headlines. In each one of these articles there are specific quotes that show why these articles are not relevant to Napa County, as our forests are *not tropical*.

> "Any realistic plan to reduce global warming pollution sufficiently—and in time—to avoid dangerous consequences must rely in part on preserving tropical forests" (Scheer and Moss, 2012).
>
> "Ongoing destruction of tropical forests in Brazil, the Democratic Republic of the Congo and Indonesia is particularly concerning, because these forests store huge quantities of carbon, as well as containing high levels of biodiversity," (Picheta, 2019).

Both articles call out tropical forests specifically. In addition, a highly respected scientific group, the Union of Concerned Scientists, makes it a point to single out tropical deforestation. On the page of their website that is titled "Global Warming Solutions: Stop Deforestation" they talk exclusively about tropical deforestation (Union of Concerned Scientists).

> **<u>Question 2</u>: Why are topical forests so routinely called out specifically regarding this issue?**

Intuition might say it is just because they have more carbon stored than in other forests. After all, those pictures of the densely vegetated Amazon sure looks like it can store a lot of carbon. However, our common sense idea about the natural world has failed us once again. It turns out that the opposite has been shown to be true, and that "the highest biomass carbon occurs in temperate latitudes" (Keith et al., 2009). So, if the tropics contain less carbon, but are still mentioned as more important in terms of deforestation, this means there must be more to the story.

While $CO_2$ may be the poster child for the cause of climate change, it is hardly alone in its quest to warm the planet. Other gases such as methane, nitrous oxide, and even water vapor play a part (Earth Science Communications Team, 2019). However, in terms of deforestation and this letter the relevant gas is still $CO_2$ and water vapor. This is where the story gets more complex, there are actually cooling benefits to climate that come with deforestation which include increasing surface albedo (Bala et al., 2007), and increasing outgoing latent heat flux (Longobardi et. al., 2016). Here is a quick definition of both of those terms:

> Albedo (al-bee-doh) is a measure of how much light that hits a surface is reflected without being absorbed. Something that appears white reflects most of the light that hits it and has a high albedo, while something that looks dark absorbs most of the light that hits it, indicating a low albedo ("Albedo").

> Latent and sensible heat are types of energy released or absorbed in the atmosphere. Latent heat is related to changes in phase between liquids, gases, and solids. Sensible heat is related to changes in temperature of a gas or object with no change in phase ("Latent and Sensible Heat").

As you can see, we have quickly gone from carbon storage being the only thing we think about, to a situation where we have to measure very difficult properties of incoming vs outgoing radiation and net energy flow. Luckily, this work has been done by qualified professionals.

> **<u>Question 3:</u> Once we look at all the factors involved in climate change, would preserving trees in Napa County mitigate climate change?**

This is where all the difficult pieces come together and where, once again, common sense fails us. Remember our answer to Question 1, where the news articles specifically single out tropical deforestation? The reason is due to numerous studies that have concluded that deforestation in temperate regions, like Napa County, likely has no effect on global climate because the cooling effect by an increase in surface albedo and increase in outgoing latent heat flux *offset* temperature changes from the added carbon to the atmosphere. Quotes and sources are as follows:

> "Another policy relevant implication is that large-scale afforestation implemented in temperate latitudes may be largely ineffectual in mitigating global warming" (Bala, et al 6553).

> "Temperate deforestation produces local cooling due to dominant albedo change and remote warming due to carbon-cycle effect; these effects cancel each other on a global-mean basis" (Bala et al., 6552).

> "That doesn't mean that all forests cool the planet, however. Researchers have known for decades that tree leaves absorb more sunlight than do other types of land cover, such as fields or bare ground. Forests can reduce Earth's surface albedo, meaning that the planet reflects less incoming sunlight back into space, leading to warming. This effect is especially pronounced at higher latitudes and in mountainous or dry regions, where slower-growing coniferous trees with dark leaves cover light-coloured ground or snow that would otherwise reflect sunlight. Most scientists agree, however, that tropical forests are clear climate coolers: trees there grow relatively fast and transpire massive amounts of water that forms clouds, two effects that help to cool the climate." (Popkin, 2019).

> "Mean global SAT anomalies, while statistically significant by year 2100 (Table 1), are small and straddle zero K. At the end of the century the general tendency is cooling in the lower deforestation fraction with slight warming in the 15% and 25% scenarios. The larger input of $CO_2$ into the atmosphere results in initial warming for deforestation of and above 45% (see Carbon Cycle section below). By mid-century albedo effects overcome the initial increase in greenhouse gas concentration and at the end of the simulation these scenarios exhibit very small SAT change or some cooling (Fig 7). The increase in local albedo dominates the temperature response over deforested areas which remain colder than the control even during periods where higher atmospheric $CO_2$ cause mean global positive SAT anomalies (Fig 7)." (Longobardi et al, 2016.)

In order to present an unbiased selection of studies and because the Intergovernmental Panel on Climate Change (IPCC) is considered a leader on this subject, I want to point out that the IPCC does list

deforestation as a driver of climate change (IPCC, 2014). Here, once again, a deeper look is needed. In this chapter, one study was cited regarding deforestation, and the title specially reads, "Proximate causes and underlying driving forces of tropical deforestation" (IPCC, 2014). The study was in reference to tropical deforestation, and that alone.

The Popkin (2019) quote may sum up the state of the science best. Some articles suggest a slight cooling, some suggest a slight warming, but whatever the answer is, temperate deforestation is not likely to have any strong effect, good or bad, on earth's climate.

## Section 2.2: Modeling Potential Methods to Reduce Climate Change

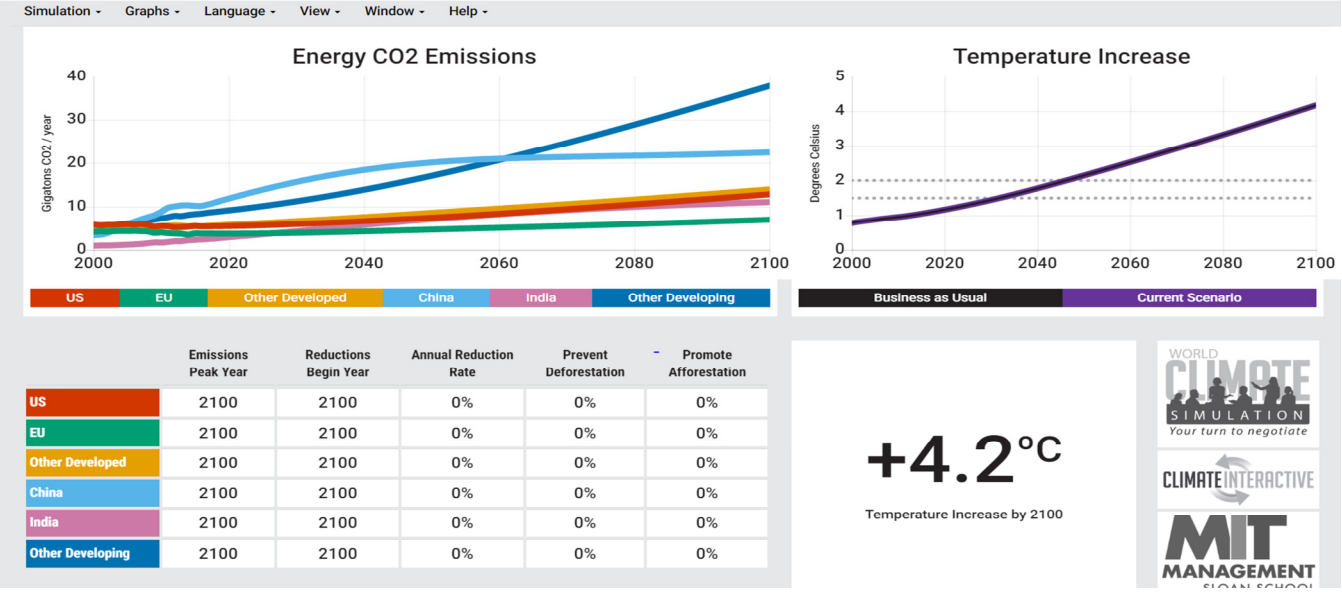
If you are skeptical of these findings, or believe they might be cherry-picked, allow me to present one more piece of data about how little deforestation actually affects climate change. The following images will be from what is called C-Roads, which is an online "Climate Change Policy Simulator" designed specifically to "test strategies for tackling climate change" (C-ROADS). Here is "Role of C-Roads" from their website:

> "The model was reviewed by an external scientific review committee, chaired by Sir Robert Watson, former Chair of the Intergovernmental Panel on Climate Change (IPCC). The reviewers recommended C-ROADS for widespread use. Read a summary of their review here."
>
> "Since 2008, C-ROADS has helped the world to understand the impact of the emission reduction pledges countries have proposed to the United Nations. These proposals take different forms, with different reference years, reference scenarios, target years, and types of proposals. However, using C-ROADS we can rapidly test these policies and determine whether collectively they are enough to stabilize temperature below 2°C. More complex integrated assessment climate models also have this ability, however, such models can be slow to run and are inaccessible to everyday people."
>
> "C-ROADS is being used at top government, corporate, and NGO levels, and by individuals participating in or monitoring the UNFCCC negotiations. Read comments by some of our users at the US State Department and European Environment Agency (C-ROADS)."

The next page shows what the homepage of the model looks like and I encourage the reader to go online to play around with it: www.climateinteractive.org/tools/c-roads/. There are six different regions and in each you can manipulate policy changes and see how they would affect global climate in an attempt to achieve the IPCC's goal of stabilizing the temperature increase at or below 1.5 degrees Celsius. These policies include when emissions are to peak, when emissions begin to reduce, how much they reduce annually, how much deforestation is prevented, and how much afforestation is promoted. Note that the first three columns of variables are linked only to emissions and not to deforestation or afforestation. For example, even if the emissions peak year is set to 2100, the start year for prevention of deforestation is always 2016. Upon updating these parameters, the model informs you how much effect a policy scenario will have on global climate.

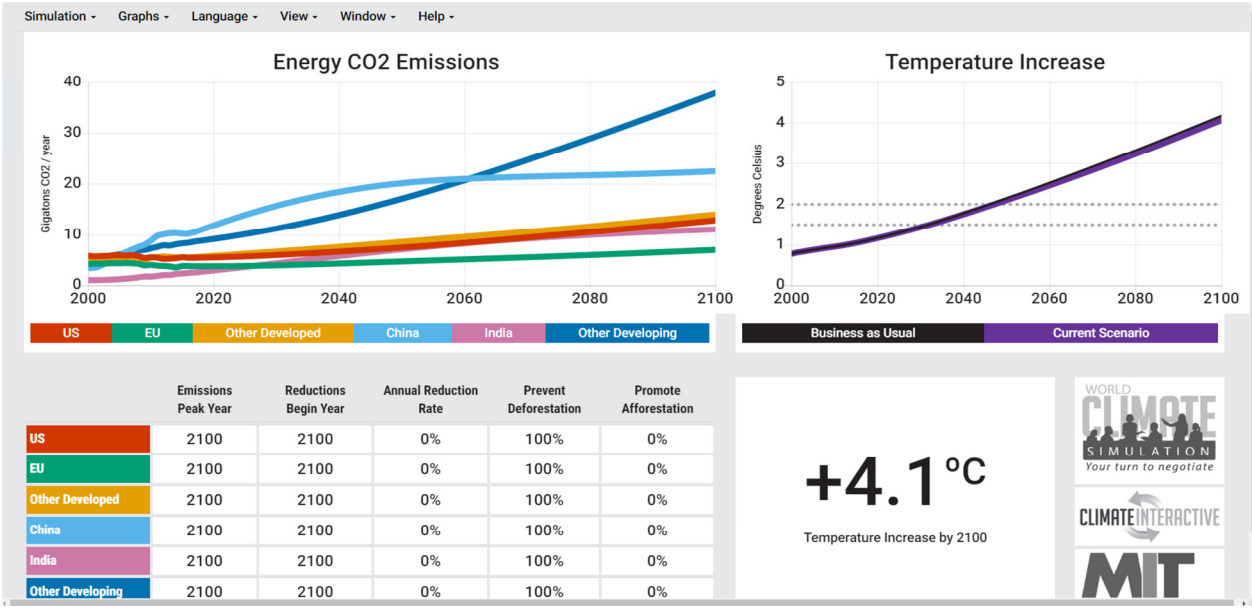
I have presented a few scenarios below.

**Scenario 1: Baseline or "Business as Usual"**




In this scenario, we see the "business as usual" scenario where no one is peaking in emissions and global climate is set to raise by 4.2 degrees Celsius by 2100.

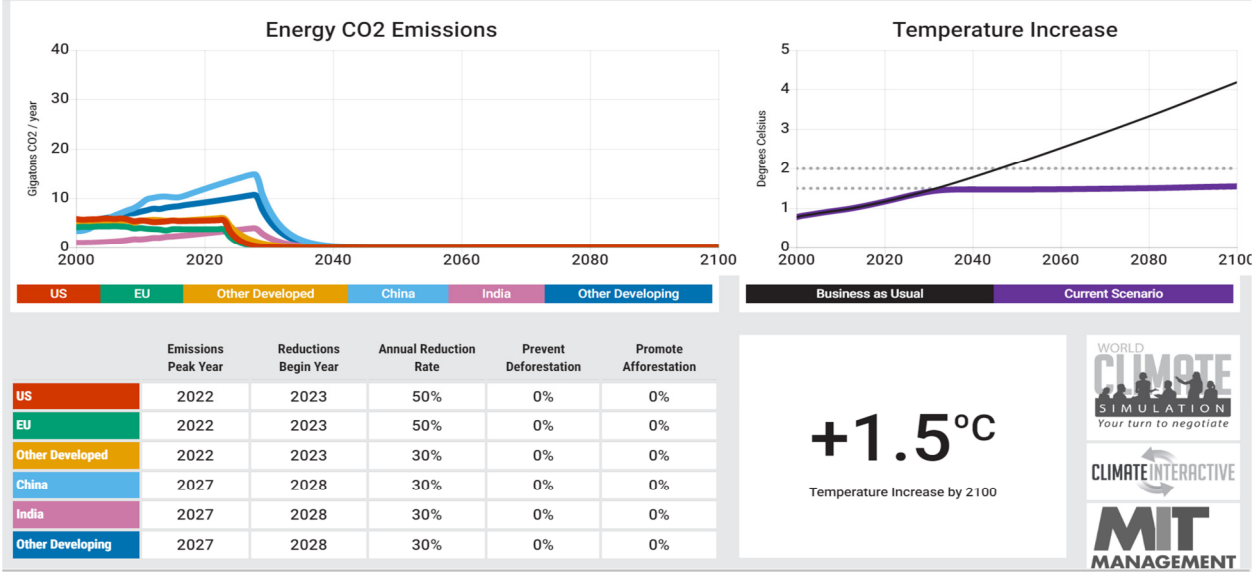
**Scenario 2: Preventing 100% of Future Deforestation**




This shows that if the entire world "Prevented Deforestation" by 100%, it would prevent a mere 0.1-degree Celsius increase as compared to the Business As Usual scenario. Remember, the scientific consensus is to stabilize the temperature increase at or below 1.5°C. This Draft Ordinance is suggesting 70% tree retention and not 100% as modeled above. The reason this scenario is included is because the

entire focus of the Draft Ordinance is the prevention of deforestation, but this model run illustrates that if alleviating climate change is truly the goal, then this is the wrong way to go about it.

**Scenario 3: Focusing Entirely on Emissions Reductions**



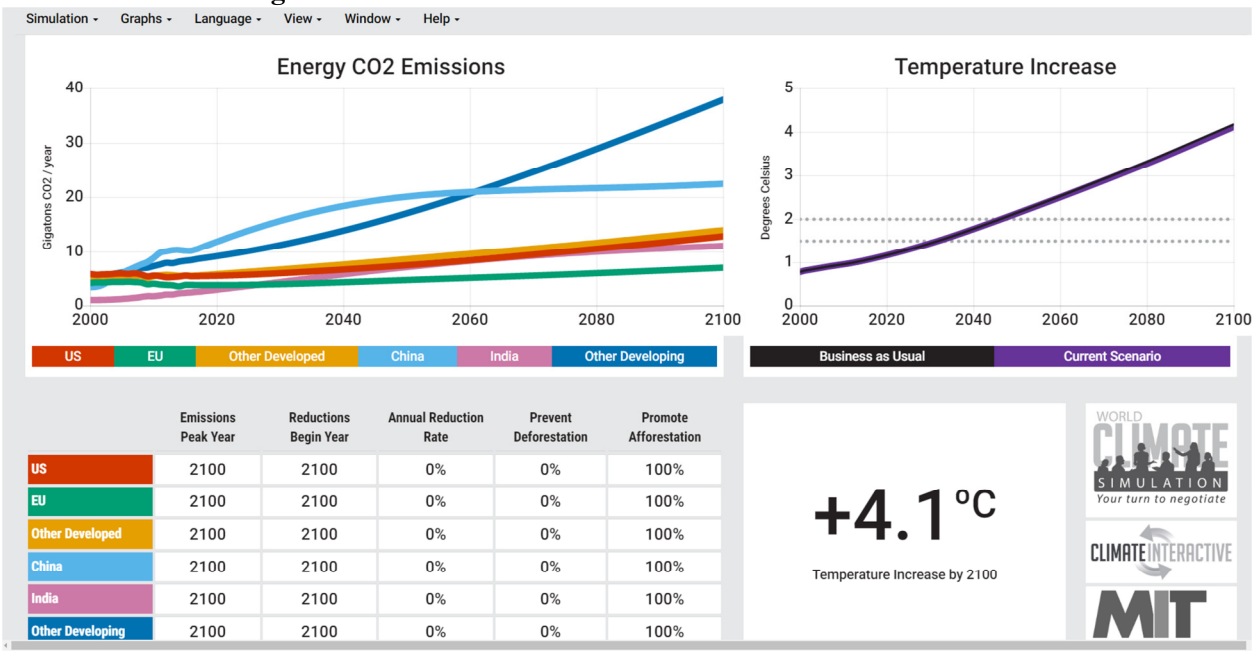

| | Emissions Peak Year | Reductions Begin Year | Annual Reduction Rate | Prevent Deforestation | Promote Afforestation |
|---|---|---|---|---|---|
| US | 2022 | 2023 | 50% | 0% | 0% |
| EU | 2022 | 2023 | 50% | 0% | 0% |
| Other Developed | 2022 | 2023 | 30% | 0% | 0% |
| China | 2027 | 2028 | 30% | 0% | 0% |
| India | 2027 | 2028 | 30% | 0% | 0% |
| Other Developing | 2027 | 2028 | 30% | 0% | 0% |



In the model run shown above, we have decreased each region's emission of greenhouse gases, but have not altered the deforestation or afforestation factors. Under this scenario, we have made it to the 1.5 degrees Celsius increase goal, stopping runaway climate change and its most devastating effects. We did this by focusing all available attention and resources on emission reductions.

Even if you run this scenario with 100% prevention of deforestation, it would only show an extra 0.1-degree Celsius decrease consistent with Scenario 2, suggesting once again that reducing emissions should be the utmost focus to help mitigate global warming.

**Scenario 4: Promoting Afforestation as Focus**




This last scenario was done to extinguish any remaining doubt as to forests' role in climate change. Focusing on forests is not the answer in stopping climate change. In full disclosure, I could not find a precise definition as to what "Promoting Afforestation" meant.

## Section 2.3: Agriculture and Climate Change

In discussions surrounding this Draft Ordinance, I have heard questions and concerns regarding agriculture's contribution to climate change. Certain agricultural processes emit greenhouse gases and those need to be taken into account; however not all agriculture is created equally. It has been shown that vineyards range between carbon neutral and carbon sinks (Brunori et al., 2016; Kroodsma, 2006). The reason why the argument against agriculture may not be as applicable to vineyards may be due to the fact that they are a woody, perennial crop (Nistor, 2018). Another way in which vineyards separate themselves from a traditional annual crop is through less tillage, which drastically cuts the release of $CO_2$ (Nistor, 2018). The following quotes explain this:

> "Relative to other crops, grape growing produce smaller CO2 quantities and in the same time "consumes" CO2 by photosynthesis." (Nistor, 2018)

> "Annual crops can't be considered net carbon sinks, but perennial or permanent woody structure species, with a life of decades, like tree crops or vineyards, with plenty of pruning material left or buried in soil, could act as carbon sinks (Gianelle et al. 2015)" (Nistor, 2018).

> "The $CO_2$ sequestration of one hectare of vineyard ranged between 5.72 (±0.07) and 7.23(±1.11) tC $ha^{-1}$ $year^{-1}$." (Brunori et al.)

Many vineyards, particularly those in Napa County under an engineered Erosion Control Plan, have a permanent cover crop requirement that ensures this condition is met.

## Section 2.4: Summary of Climate Change Discussion

As shown in the model runs and peer-reviewed literature cited above, if you focus on deforestation for mitigating climate change, if you dedicate time, money, and resources to that cause, then you are doing the environment a disservice and openly denying science. The focus should be on emissions reductions, and that alone.

There is absolutely nothing bad or embarrassing about an initial assumption being wrong. This brings us back to the beginning of the letter, the scientific process. This is how it has unfolded for this Draft Ordinance thus far:

1. Make observation: Trees absorb carbon.
2. Ask a question: Since trees absorb carbon, would the prevention of tree cutting in Napa County be a benefit to the climate?
3. Propose hypothesis: The prevention of deforestation in Napa County will be an effective and efficient way to help mitigate climate change.
4. Make prediction: If stored carbon is all that matters, studies will show that prevention of deforestation in temperate forest will be a benefit, as will climate models.
5. Test predictions: Conduct a literature review of the available evidence from peer reviewed sources, and use available climate models.
    a. These predictions did not happen. The literature shows little to no benefit in prevention of deforestation in regards to climate change, as do the models I have at my disposal.
    b. The hypothesis is likely wrong.
6. Iterate: Since deforestation was not the correct route, and our model showed that focusing on reducing emissions was the proper route, how do we do our part in that realm?

We can conclude that this Draft Ordinance will not likely have an effect on mitigating climate change. Reducing emissions in Napa County will have an effect on mitigating climate change.

# SECTION 3: WATERSHED HEALTH

The second main rationale behind the Draft Ordinance is the overall health of the watersheds in Napa County, specifically water quality. Here again, if you listen to the public comments, it wouldn't be surprising if someone left thinking that if they threw a match into the Napa River it would catch on fire due to extreme pollution. What is the reality?

The United States Environmental Protection Agency (USEPA) is a federal agency tasked with protecting our environment. They identify water bodies such as rivers and lakes as "impaired" if they do not meet goals that have been laid out for that water body. For instance, a goal for the Napa River is to provide salmonid spawning habitat and so sediment is a concern here; an isolated lake in the mid-west may not have that same goal and therefore sediment is not a concern there. It is then up to the State Water Resources Control Board (SWRCB) and the Regional Boards to determine how to meet those goals to improve water quality.

## Section 3.1: Nutrients and Pathogens

The Napa River is currently listed as impaired on the USEPA 303(d) list due to nutrient levels and has been since 1976 (USEPA, 2015). However, in terms of nutrients, the water quality has gotten much better, resulting in a proposal to delist the Napa River for nutrients (SFBRWQCB, 2018). This proposal

has been accepted, but the final approval is still in process as it can take many years to approve such a major amendment to the 303(d) list. Nutrients are a cause of concern in agricultural areas resulting from fertilizers that run off of the fields (USEPA, 2019). Vineyard area has increased since the listing of the Napa River and nutrients in the water have decreased, which speaks to an incredible accomplishment of our existing environmental regulations and do not suggest further regulation is needed regarding nutrients.

We also note that the Napa River is listed for pathogens, specifically fecal bacteria, which can be released by cattle and grazing animals, wastewater treatment plants, and faulty septic systems. The Draft Ordinance does nothing to directly regulate the amount of pathogens, nutrients, or any other chemicals applied in our watersheds.

**Section 3.2: Sediment**

This seems to be the main focus of the ordinance in terms of watershed health. So what do we know about sediment in the Napa River? The Napa River is listed as "Impaired" for sediment (Napolitano, 2009), however we know an astonishingly small amount about recent years, as most of the data we have is now over a decade old. Since its listing, very few studies have been done on turbidity (how much sediment is in the water) of the Napa River. There are a few things we do know though. In 2009, the Napa River Watershed Sediment TMDL and Habitat Enhancement Plan concluded that 67,000 metric tons per year of sediment delivery to Napa River at Soda Canyon Road was a result of vineyards and/or livestock grazing. While that might seem large, there was a total sediment delivery of 269,000 metric tons per year at that location, making these two land uses a mere 25% of the total sediment (Napolitano, 2009). There is something peculiar about this finding though. This was determined using the Universal Soil Loss Equation (USLE). This equation uses a variety of factors to determine soil loss from specific areas. The relevant factor for our purposes is percent vegetative cover, or how much of the ground is covered with vegetation – the "C" factor in the USLE commonly referred to as 'cover crop'. The TMDL study used what works out to a 52% cover for vineyards. It is bewildering as to how they got this number. There is no erosion control plan that the staff here at PPI can think of that requires less than 60% vegetative cover, leaving the average well above the study's assumptions. Using a realistic value for vineyards, which PPI staff would argue to be 70% cover, would drastically decrease the TMDL's assumed contribution of vineyards to the sediment load.

Setting the questionable assumptions aside, where did the other 75% of the sediment come from? Well, some of that is natural – it was estimated that 37% of the sediment was from natural sources. Erosion is a natural process – think of the Grand Canyon for an extreme example. The rest came from roads and channel incision (Napolitano, 2009).

If you are still thinking this is a lot of sediment, another fact to keep in mind is not all vineyards at the time of the study were farmed under an Erosion Control Plan. Since the requirement for vineyards to have an Erosion Control Plan was not adopted until the early 1990's, not all vineyards had been replanted and thus did not have an Erosion Control Plan. That is still true to this day, although the number of vineyards farmed without an Erosion Control Plan grows smaller each year as those that were in place prior to the requirement are replanted, and replanted hillside vineyards require an Erosion Control Plan. During the development of an Erosion Control Plan, Napa County requires site-specific studies showing that there is no net increase in surface erosion. If a piece of land has good tree canopy, the USLE will take that into account and a higher percentage cover crop will be required if a vineyard is planted there, due to the County's policy of no-net-increase in erosion. The USLE analysis that is completed for each vineyard

under an Erosion Control Plan must show a decrease or no change in erosion or else the County cannot approve it.

How do vineyard projects meet these stringent standards? Within the vineyard blocks, it is often the use of cover crop management or straw wattles, scientifically studied using the USLE method discussed above. On a larger ranch property, one of the big-ticket sediment reduction items is improving old ranch roads. Roads are notorious for high rates of erosion, cut-slope failures, and in remote areas often have unimproved crossings going right over streams that results in "hydrologically connected" road systems that move eroded sediment directly into waterways.

I am veering away from a scientifically-studied argument but wanted to point out this practical concern anyway. If development is halted or made even more difficult, there will be less financial means available for rural landowners to improve those existing roads. The San Francisco Basin Plan identified rural roads as a contributor of sediment in the Napa River watershed. The Draft Ordinance ignores this source completely.

Sediment from vineyards is already highly regulated, and no studies on sediment load from vineyards have been done in a decade. Before further regulation of vineyards in ways that aren't scientifically shown to reduce soil loss, more data and more research on that data would need to be conducted both on the sediment load that is currently produced by all sources (including vineyards, grazing lands, urban land uses, ranch roads, etc.), and what percentage of tree canopy retention (if any) would offset the problem. Allow me to give an example to describe what I mean. If a watershed study was conducted and concluded that 90% tree retention would only result in a decrease of erosion of 1%, it should be obvious that focusing solely on tree canopy retention would be the wrong approach to overall watershed health. Does this defy common sense? What happened when we listened to common sense in the climate portion? It failed us. The only way to know is to do a study. The problem is that we have no idea what tree canopy retention would do to soil loss. As with climate change, no study, no work, no research, and no data was used in concluding what percentage of trees to retain. That should be alarming.

**Section 3.3: Salmonid Habitat as a Proxy for Watershed Health**

The term "salmonid" refers to fish species that spawn in freshwater streams, and then the juveniles travel to the ocean to grow before eventually returning to freshwater to spawn at the end of their lifecycle. Locally, Chinook salmon (*Oncorhynchus tshawytscha*) and Steelhead trout (*Oncorhynchus mykiss*) are the two salmonid species found in some of our watersheds. People often cite the annual abundance of salmonids as an indicator of our watershed health.

There are numerous reports we can look to on this subject, including from the Napa County Resource Conservation District, a respected scientific and non-partisan organization with local knowledge (Koehler, 2005). They have worked on the Napa River Watershed Steelhead and Salmon Monitoring Program since 2009 (Koehler and Blank, 2018). This report from 2018 quotes the following about Chinook smolts:

> "The 2018 CPUE for Chinook smolts declined from 2017, but it was still the third highest value in the program's 10-year record (Figure 8). The year-to-year variability in Chinook abundance suggests that the Napa River population is relatively small and especially affected by (1) natural fluctuations in rainfall and runoff quantity and timing, and (2) inputs of stray salmon (i.e. adult

> fish from other river systems or hatcheries that enter the Napa River) that spawn in the watershed in an any given year." (Koehler, 2018)
>
> "Steelhead smolt catch-per-unit-effort (CPUE) showed an increasing trend in 2018 and was the fourth highest value in the program's 10-year record (Figure 7). CPUE from 2009 to 2012 exhibited a stable or slightly increasing trend, followed by notably lower catch rates from 2013-2017. Drought conditions persisted in the region from 2013-2016, so the increased catch in 2018 may represent a recovery (albeit relatively slight) from those low rainfall years." (Koehler, 2018)

This is from the 2017 report:

> "From 2009 to 2012, steelhead CPUE appeared to exhibit a stable or slightly increasing trend, followed by a notable decline in 2013 and continued lower catch rates through 2017 (Figure 4). Juvenile steelhead require cool perennial stream habitat to survive the dry season; such habitats were greatly reduced during drought conditions from 2013 - 2016. It is therefore likely that much of the decline in steelhead CPUE may be explained by a reduction in suitable rearing habitat during the same period." (Koehler, 2017)

Here these reports blame natural causes including natural fluctuations in rain and runoff, as well as drought conditions, for the low numbers of these fish, and not sediment or other pollutants. What's more is the Chinook and steelhead smolts were recorded in some of the highest numbers since the recording started, with Steelhead having an increasing trend.

Another important aspect to this conversation is the recognition that the mainstem Napa River is not the only water body in the County, and many of the others are doing well as per Stream Survey Reports done by Napa County RCD in 2012 (NCRCD and PCI, 2012). The study discusses, among others, Mill Creek and Ritchey Creek as providing "high quality habitat for steelhead and/or resident rainbow trout". This high-quality habitat exists in the watershed under today's regulations, and I believe it shows that our existing regulations are working.

This is not to say that the Napa River watershed is without its problems, especially in regards to sediment. There were RCD reports of other tributaries that discussed how they were not in good shape and should be addressed, some for sediment, and many for other reasons. The bottom line remains the same: do the studies and focus on particular water bodies. Do not apply a one size fits all policy in a place as diverse as Napa County.

**Section 3.4: Summary of Watershed Discussion**

There are few studies that exist, and those that do are old and need to be updated. Further research needs to be done on the turbidity of various waters in Napa County as well. This is why I am drawing no conclusion as to the state of the water quality in Napa, and therefore cannot determine the current effect of vineyards and urban development. The same reasons I am not able to draw conclusions is the same reason the Board should not either. Again, guessing on this policy would be wrong.

So, let's look at how the scientific process played out in terms of water quality for this Draft Ordinance thus far:

1. Make observation: Our water quality in terms of sediment and nutrients has been shown to be poor in the past.
2. Ask a question: How can we effectively lower sediment and nutrient levels in the Napa River?
3. Propose hypothesis: We think retaining 70% tree canopy across the entire County will help lower sediment and nutrient loads in the Napa River.
4. Make prediction: If we look at the data, it should show that when tree canopy is retained compared to development done under an Erosion Control Plan, there should be a reduction in nutrient and sediment runoff.
5. Test predictions: No relevant/current data is available, and studies have not been done. Therefore, we may draw no conclusion.

## SECTION 4: CONCLUDING REMARKS

The people should expect and demand more of their governing bodies. History is full of examples of anti-science policy such as the one proposed here today, and history does not look upon those polices well. Well-intentioned people that support this Draft Ordinance may be quick to point the finger at climate change deniers as anti-science, but unfortunately, these people could rightfully have a finger pointed back at them. But we are not ostriches and we can pull our heads out from the sand. It has been clearly shown that arguing for this policy on behalf of climate change shows an open disregard for science and the scientific process while arguing for this policy on behalf of watershed health is done without data to back it up.

I want to make one point very clear; this letter and my findings are not a suitable replacement for a professional consultant hired to more thoroughly investigate the topics addressed. I have a bachelor's degree in Environmental Science, which allows me to read and more fully understand the findings of professionals in that field, but not to do the necessary studies myself. This is why everything presented in this letter is simply a review of available scientific literature done by qualified professionals. I did my best to show both sides of the argument. There are studies not cited that disagree with me, and also even more that do agree with me that were not included. In my training, the safest conclusion is that more data is needed. It is in that light that I present my recommendations to the Board as follows:

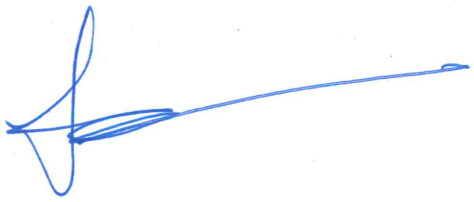
- Do not slip into anti-science policy.
    - Carefully review the science presented in this letter, even though it may seem overwhelming.
- Do not let ideological fear mongering take the place of data.
    - Go to the website www.climateinteractive.org/tools/c-roads/ and play around with the simulator to see for yourself how different scenarios provide different results.
- Do not use arbitrary numbers, like 70%, to stand in for a valid number found by rigorous scientific review.
    - Hire a qualified consultant to do a basin study to figure out what would work best for our unique and special watersheds.
- Do examine the most effective policies to reduce our emissions.
    - Hire a qualified consultant to help determine the best way to reduce emissions, as models show that reducing emissions are the most effective way to reduce climate change. Remember that traffic and housing were also priorities in the Strategic Plan.
- Do spend the time and money needed to properly evaluate the health of our watersheds and how to "fix" them.

- Do use your position on the Board to build the relationship between the scientific community and policy makers.
    - Take Paul Bartelt's recommendation to slow down this fast-track approach in order to fully understand the impacts and to craft good, solid, fact-based policy.
    - Hold workshop groups with experts and County residents in a space where discussions can happen, rather than limiting people's concerns to 3 minutes or less.

The choice is clear, with science as our guiding light there is no problem that we cannot solve, without science as our guiding light there is nothing we can.

Sincerely,

Samuel Moose



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